Coastal Structures Risk Communication of the Great Lakes Districts of the US Army Corps of Engineers

US Army Corps of Engineers
BUILDING STRONG®

Introduction and Agenda

Purpose:

Communicate the risk of breakwater and structure conditions to local

stakeholders and navigation system users. With a focus on structure

condition, function, and economic consequences of coastal structures

on the Great Lakes.

Focus Topics:

1. Coastal Structure Risk Communication
2. Condition Assessment of Coastal Structures
3. Harbor Infrastructure Inventory Process
4. Next Steps and Open Discussion

Regional Risk Communication Meetings

Regional Meetings

#1	16 Aug
#2	West Erie
#3	IN/IL
#4	West MI
#5	NE MI
#6	SE MI
#7	East Erie
#8	East Ont
#9	MN
#10	UP MI

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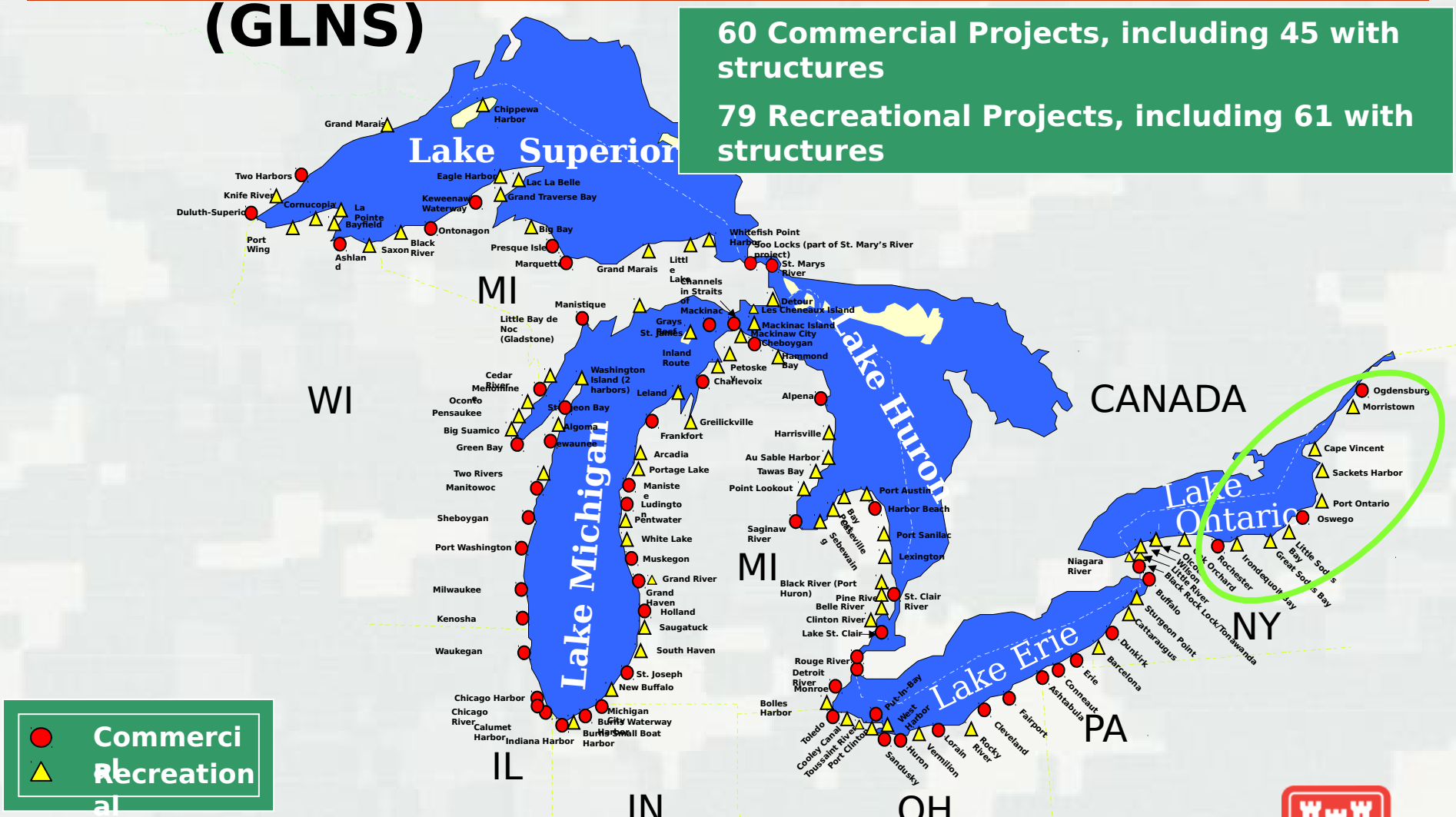
Great Lakes Navigation System (GLNS)

60 Commercial Projects, including 45 with structures

79 Recreational Projects, including 61 with structures



Commercial

Recreational

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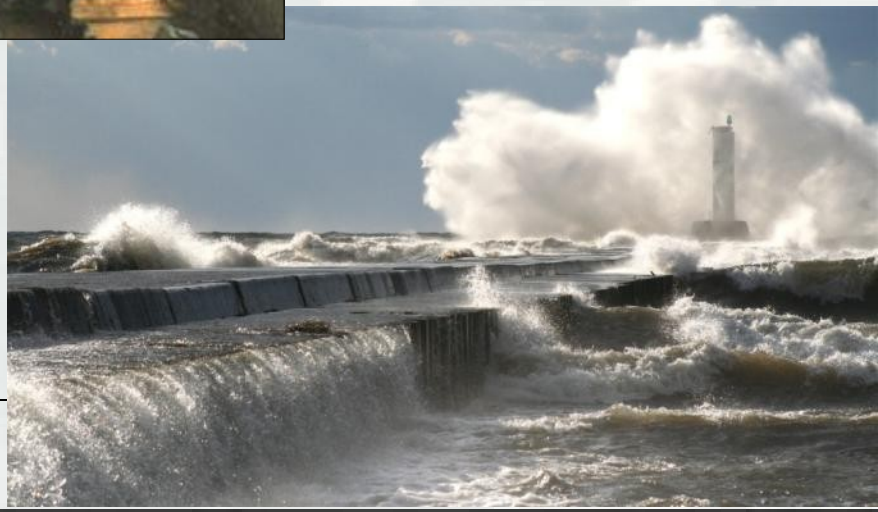
Great Lakes Navigation System (GLNS)

- 104+ miles of navigation structures on the Great Lakes
- Structures include piers, jetties, revetments, and breakwaters
- Most were built between 1860 and 1940
- Jetties and piers were constructed perpendicular to shore to keep the channel open for navigation
- Off shore breakwaters were constructed to allow safe navigation entry to harbors and channels

Navigation structures are regularly subjected to extreme winds and waves



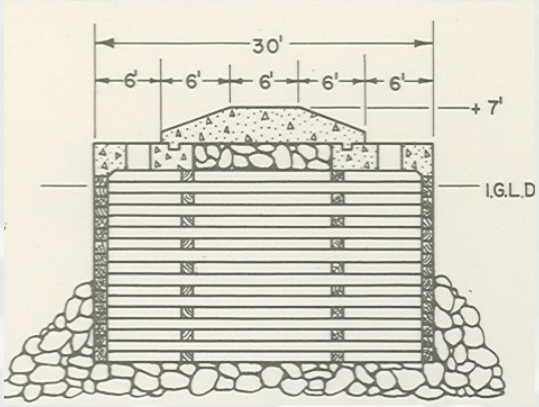
… and ice forces

Typical Coastal Structures

Steel Sheet Pile Structures

Rubble Mound/Laid-Up Stone Structures

Other Components: safety (railings, walking surface, etc.)



Typical Wood Crib/ Concrete Cap Structures Cross-section

Structure Function/Consequences

Calumet Harbor, IL&IN

Contain and reduce shoaling in navigation channel

Milwaukee Harbor, WI

Protect navigation channel and shoreline infrastructur e

St. Joseph Harbor, MI

Control wave climate within navigation channel and harbor

Coastal Structure Risk Communication

Program Objective: Communicate the risk of breakwater and structure conditions to local stakeholders and navigation system users

Process:

1. Conduct Condition Assessments
   - Commercial Harbors- Use detailed Breakwater Assessment Team (BAT) Evaluation
   - Recreational Harbors- Rely on expert elicitation
2. Conduct Harbor Infrastructure Inventory on all structures
3. Prepare summary document that conveys the current condition of the harbor infrastructure as well as the risk involved in the event of failure
4. Share with stakeholders in regional meetings

Great Lakes Structure Condition

- 50% of GL coastal structures were built before WWI
- Over 80% of all coastal structures exceed 50 years of age
- 45% have never undergone any significant repair effort due to funding constraints
- Over 30% of structures have timber crib core sections; recent low water levels have accelerated deterioration of the wood

Regional Condition Assessments

A Great Lakes regional team was established in 2008 to conduct Asset Management-based condition assessments of all Great Lakes commercial navigation structures; the Team works with USACE Engineering Research and Development Center and collaborates with the National Coastal Asset Management Board.

- Assessments completed to date
- Conditions assessment by segments: 45% of structures are rated C or worse
  - 22 miles (21%) rated C – Probably inadequate
  - 22 miles (21%) rated D - Inadequate
  - 3 miles (3%) rated F – Failed
- Cost to conduc 5 – 20M per mile

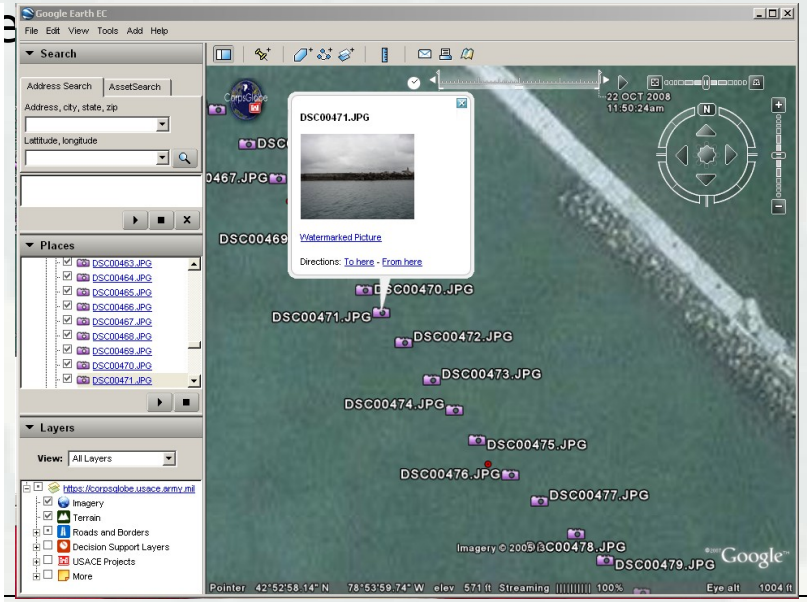
Regional Condition Assessments

- Structural Index is developed from assessment of major structure components / parameters with most direct link to structure reliability and function
- The structural index value is converted to an A thru F condition level which is used to communicate risk for planning and budgeting purposes
- Collecting complete continuous overlapping still photography and video of each structure at each project. Photos are labeled and geo

TABLE III-2

Condition Assessment Standards

Condition Classification	Definitions
A Adequate	- There is a high level of confidence that the project will perform well under the designed operating conditions. This confidence level is supported by data, studies or observed project characteristics which are judged to meet current engineering or industry standards. - There is a limited probability that the verified degraded conditions will cause an inefficient operation, or degradation or lose of service.
B Probably Adequate	- There is a low level of confidence that the project will perform well under designed operating conditions, and may not specifically meet engineering or industry standards. The project may require additional investigation or studies to confirm adequacy. - There is a low probability that the verified degraded conditions will result in inefficient operation, or degradation or loss of service.
C Probably Inadequate	- There is a low level of confidence that the project will not perform well under designed operating conditions. The project does not meet current engineering or industry standards. The project may require additional investigation or studies to confirm adequacy. - There is a moderate probability that the verified degraded conditions will result in inefficient operation, or degradation or loss of service.
D Inadequate	- There is a high level of confidence that the project will not perform well under designed operating conditions. Physical signs of distress and deterioration are present. Analysis indicates that factors of safety are near limit state. The project deficiencies are serious enough that the project no longer performs at a satisfactory level of performance or service. - There is a high probability that the verified degraded conditions will result in inefficient operation, or degradation or loss of service.
F Failed	- The project has **FAILED.** - Historically the project regularly experiences scheduled or unscheduled closures or loss of service for repairs.



Harbor Structure Condition Assessments

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Harbor Infrastructure Inventory Process

- Gather information on critical infrastructure protected by federally maintained navigation structures
  - Review Documents:
    - Project Drawings
    - Harbor Fact Sheet
    - Aerial/Satellite Photography; Photo document critical infrastructure
  - Identify Critical Infrastructure to Visit
  - Research Identified Critical Infrastructure
- Site Visit Tasks
  - Met with Local Officials, Port Authority, Harbor Master, when available
  - Visit Identified Areas/Critical Infrastructure & Gather Information
- Post Site Visit Tasks
  - Create Report Following the Standard Report Template

Harbor Infrastructure Inventory Report Content

- **HARBOR LOCATION**
- **PROJECT DESCRIPTION**

  Authorization, harbor type (commercial or recreational), length of breakwater structures and channel
- **DATE OF SITE VISIT**
- **SUMMARY OF STRUCTURES**

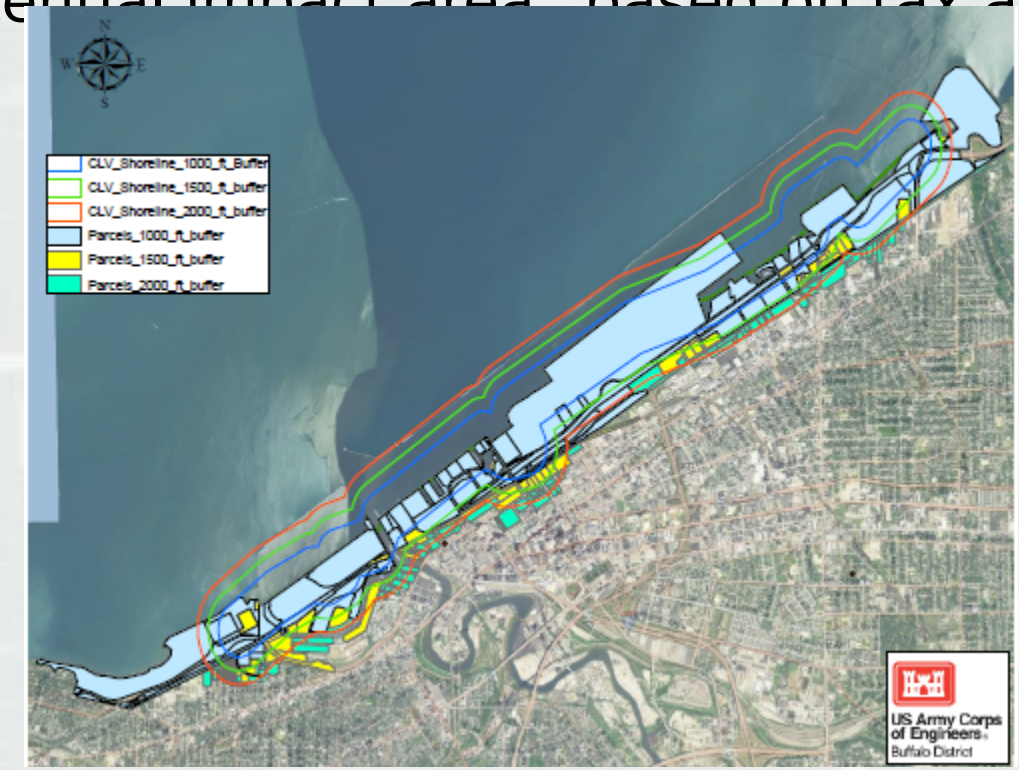
  Lists all structures and facilities that are believed to be protected by the federal navigation structures; also identify any other potential stakeholders
- **SUMMARY OF IMPACT**

  Summarizes any potential damage that could be experienced if the federal breakwater fails.
- **DESCRIPTION OF STRUCTURES**

  Aerial photo with all potential affected structures shown along with pictures and a brief description of each potentially affected structure

High Level Display of Potential Impact Areas

- Three potential impact areas were defined at 500 ft intervals
- Shows potential value of land and infrastructure within each “potential impact area” based on tax assessment data



Harbor Structure Condition Assessments

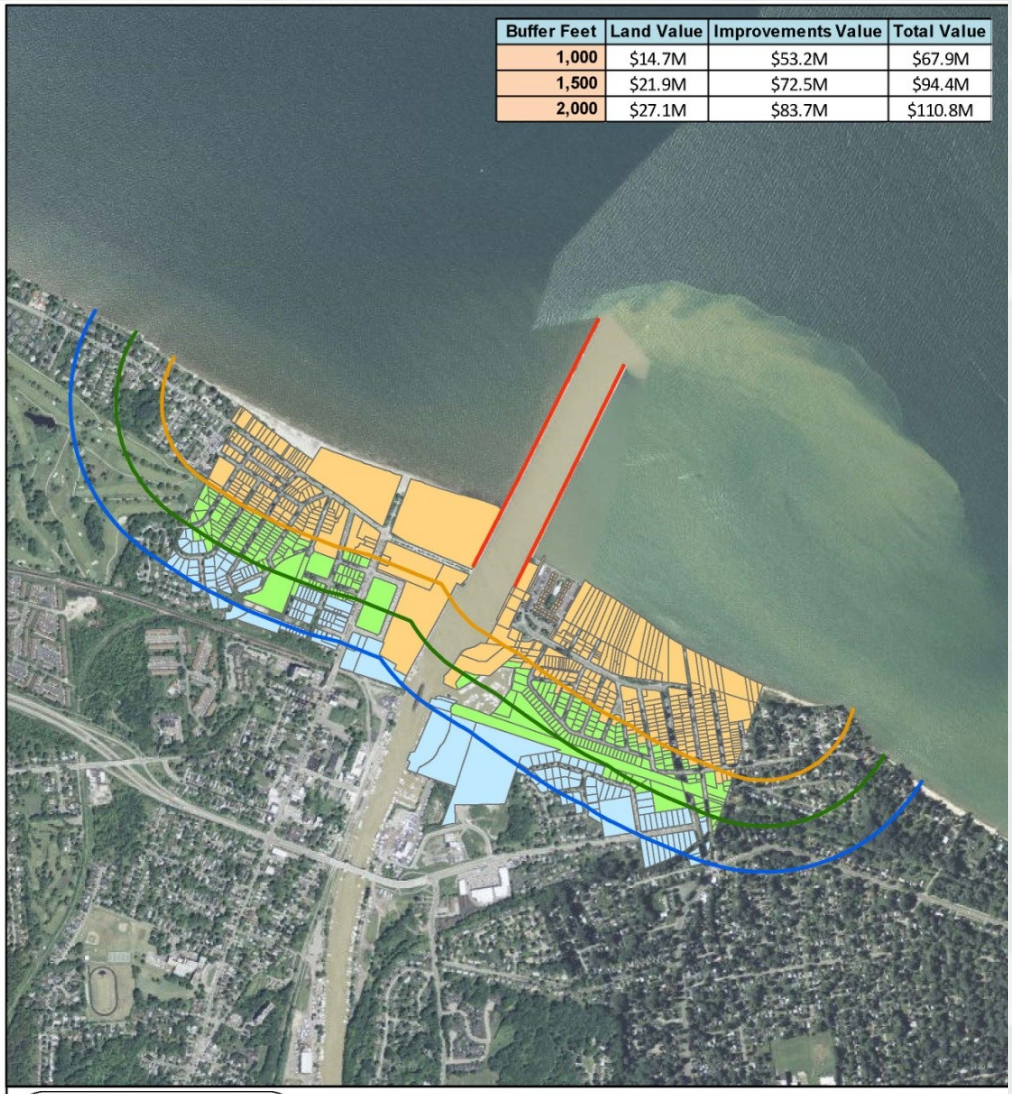
Rochester Harbor:

Rochester Harbor:

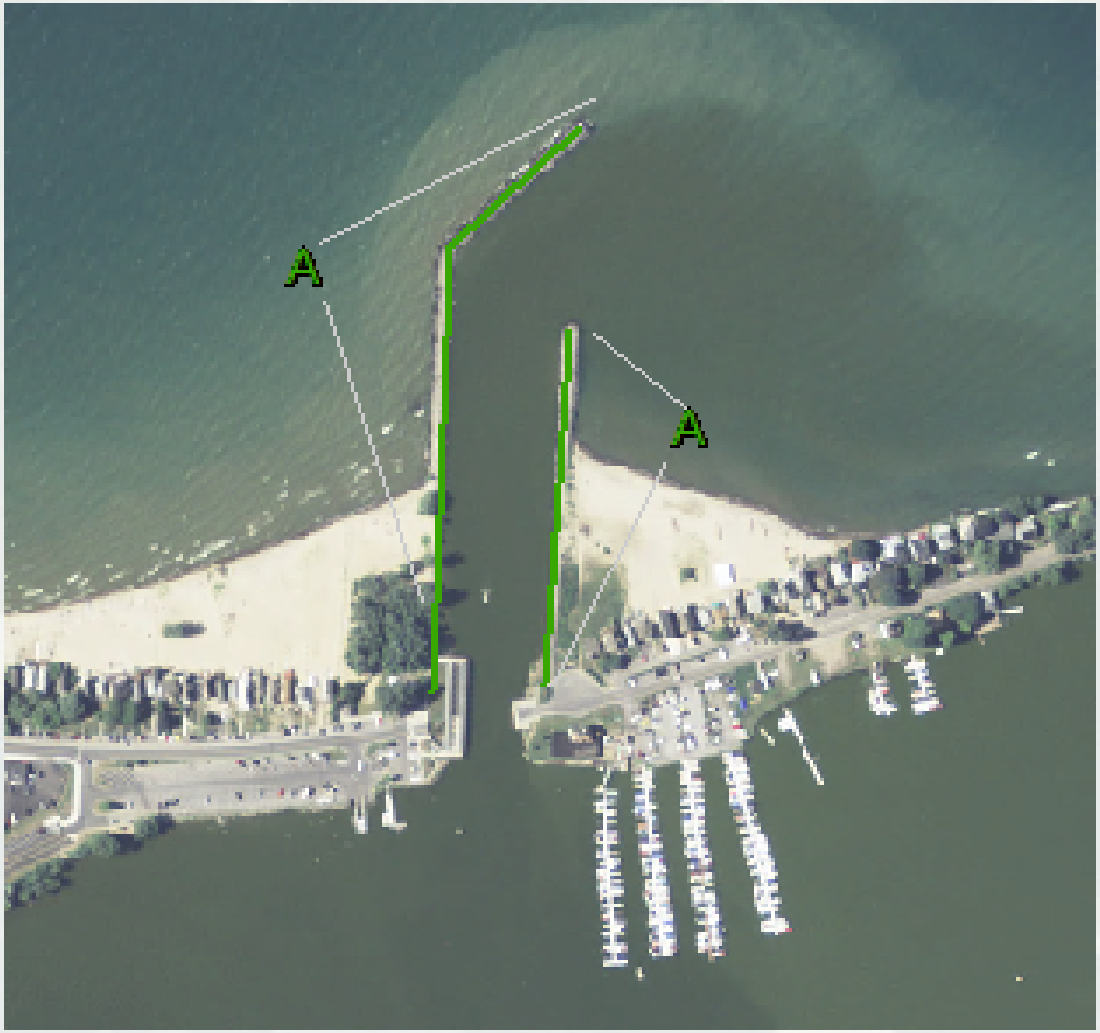
1 Ontario Beach County Park
2 Port of Rochester Terminal
3 Pelican Marina and Restaurant
4 Genesee Yacht Club
5 Shumway Marine
6 Rochester Yacht Club
7 U.S. Coast Guard Station Rochester
8 Westage at the Harbor Condominiums

Rochester Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	$14.7M	$53.2M	$67.9M
1,500	$21.9M	$72.5M	$94.4M
2,000	$27.1M	$83.7M	$110.8M



Irondequoit Bay Harbor:



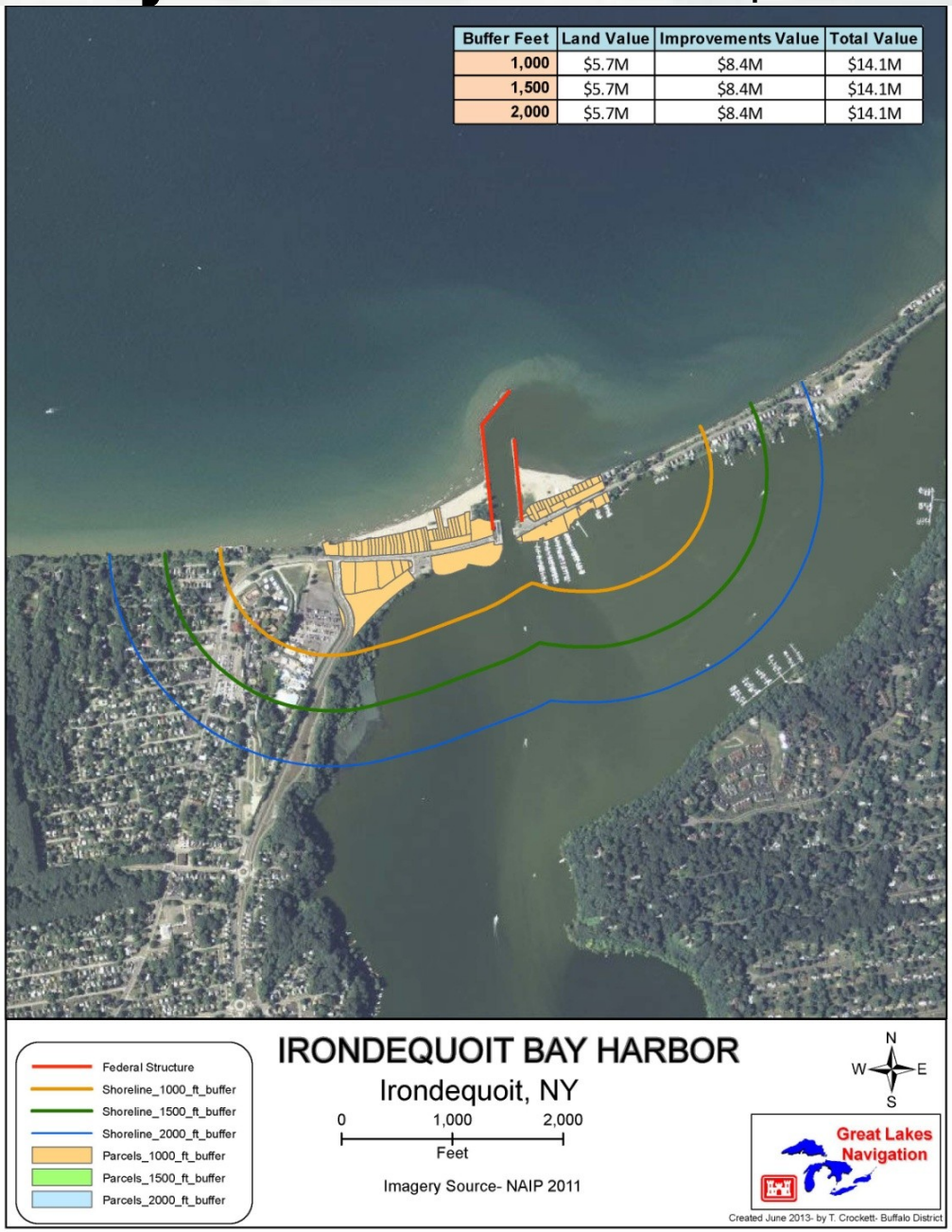
Irondequoit Bay Harbor:

1 Mayer's Marina, Inc.

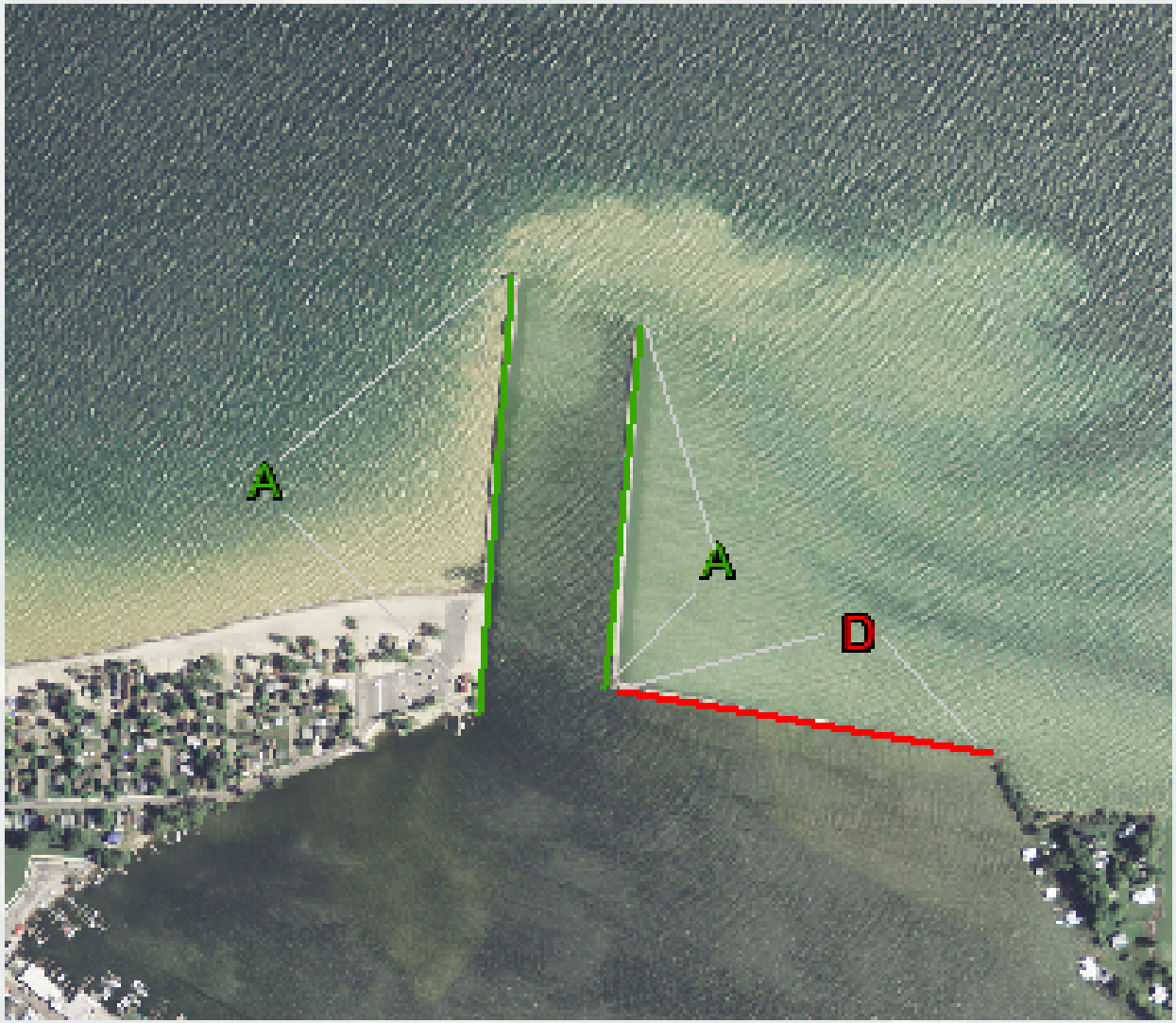
2 Private homes and beaches

3 Irondequoit Bay Marine Park – Monroe County

Irondequoit Bay Harbor: Potential Impact Areas



Great Sodus Bay Harbor:



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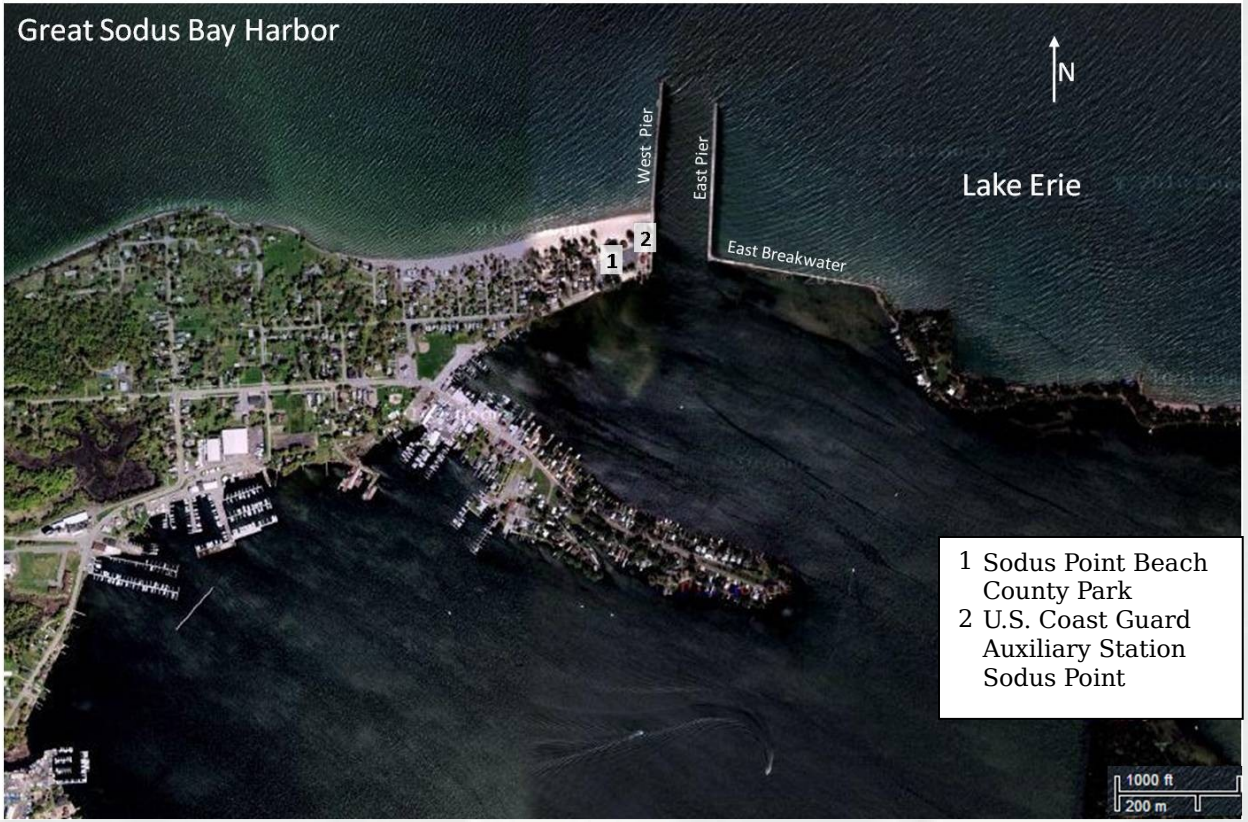
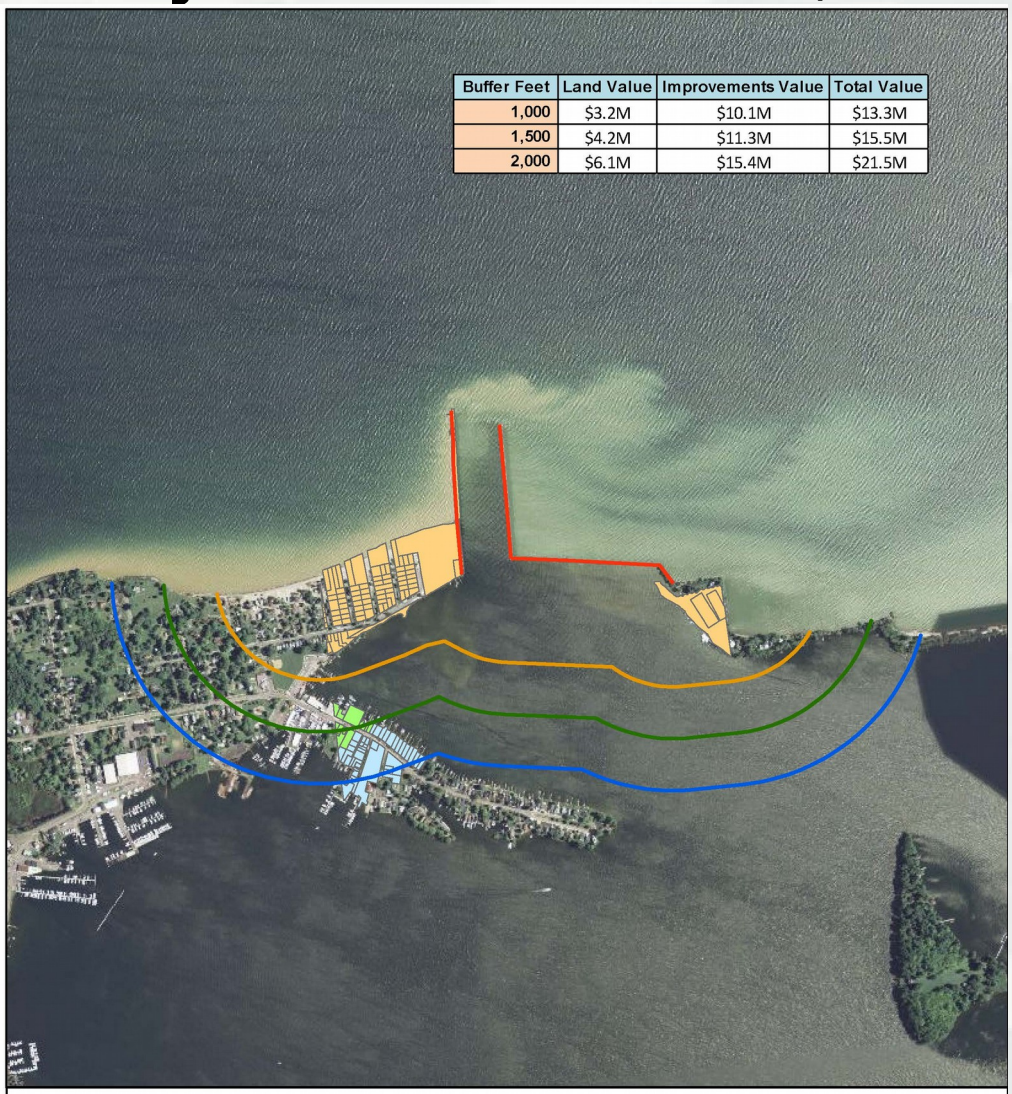


Great Sodus Bay Harbor: Potential Impact Areas

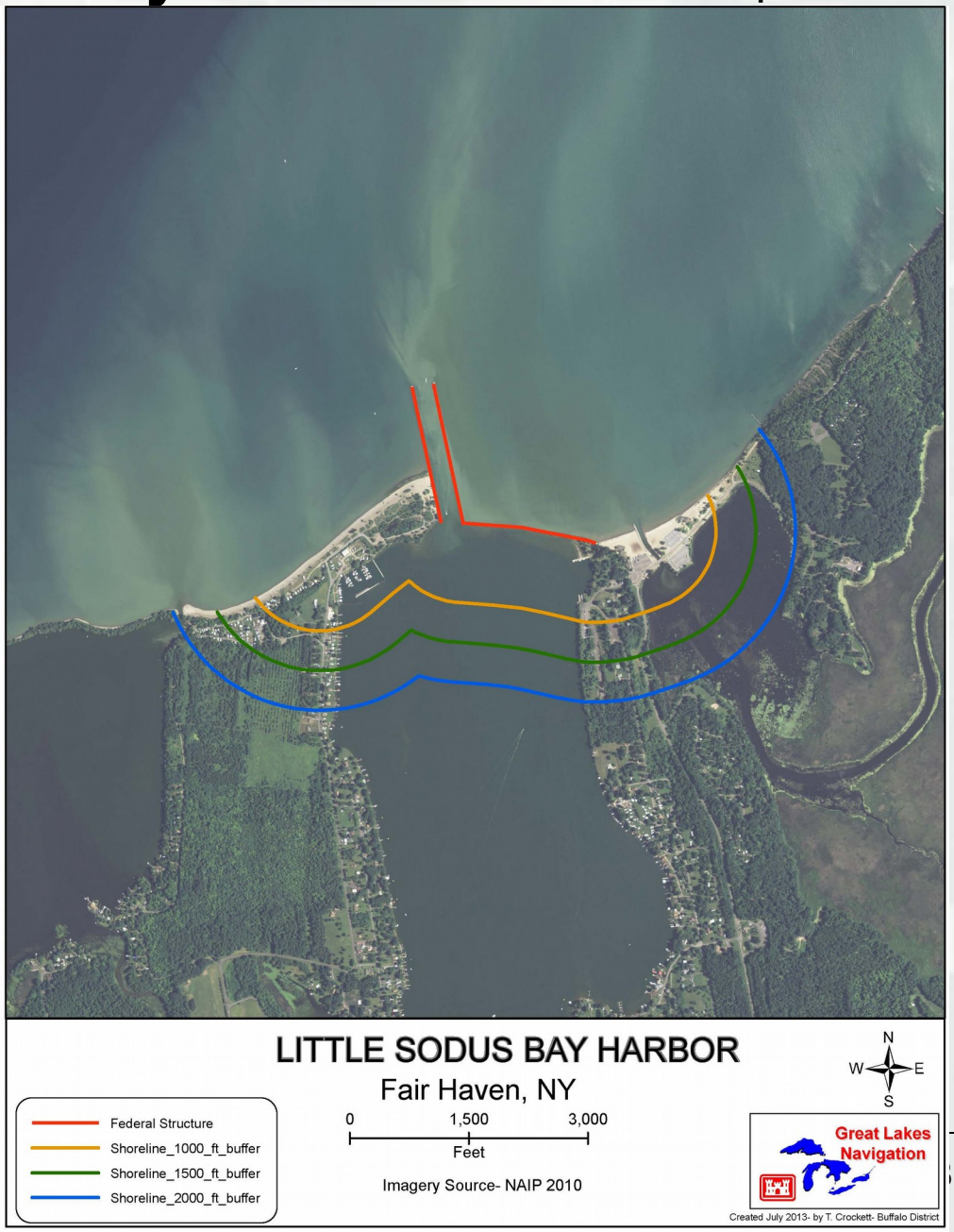
Buffer Feet	Land Value	Improvements Value	Total Value
1,000	$3.2M	$10.1M	$13.3M
1,500	$4.2M	$11.3M	$15.5M
2,000	$6.1M	$15.4M	$21.5M



Little Sodus Bay Harbor:

Little Sodus Bay Harbor:

Little Sodus Bay Harbor: Potential Impact Areas



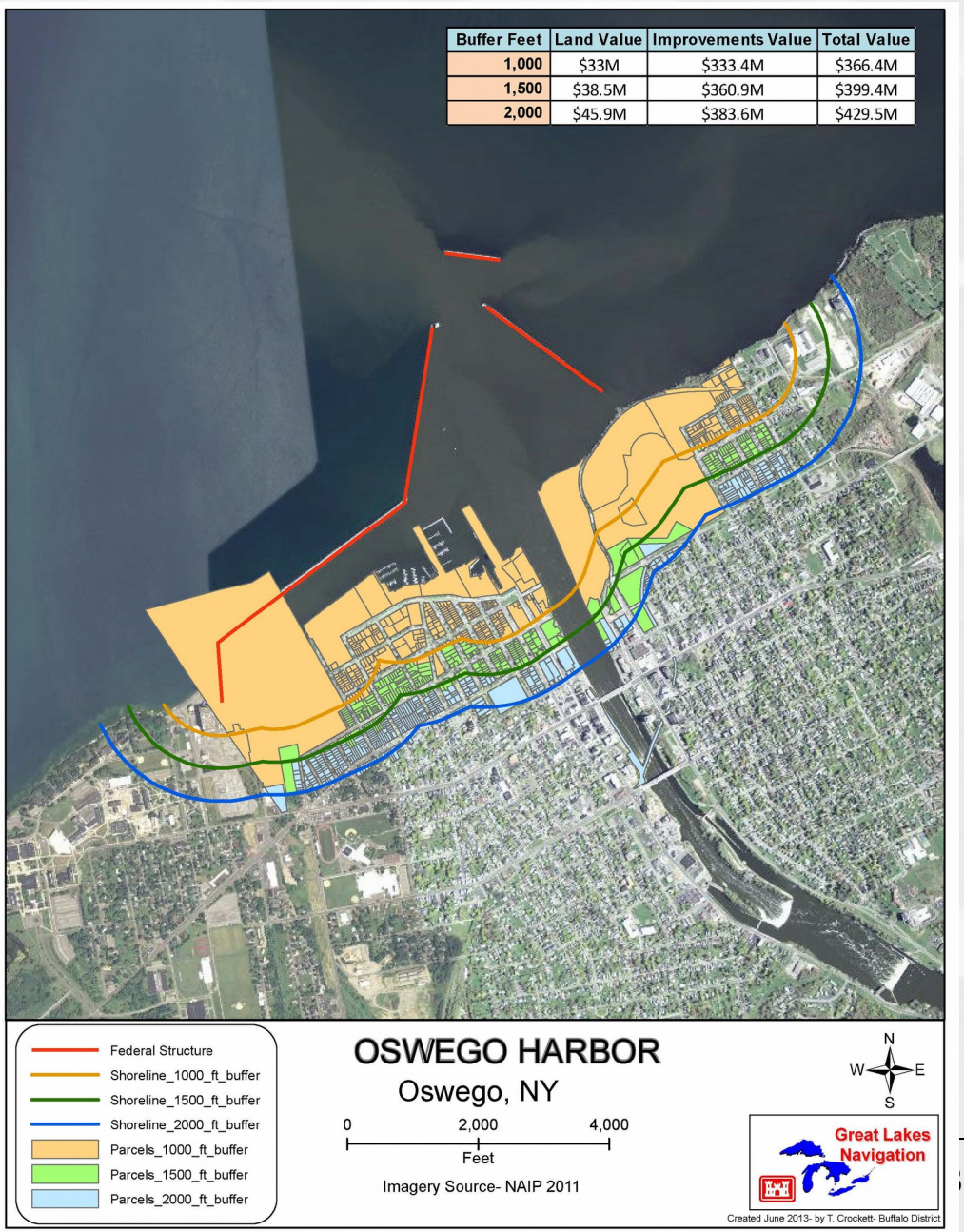
Oswego Harbor:

Oswego Harbor:

1. City of Oswego Water Treatment Plant
2. NRG Energy Oswego Harbor Power LLC
3. City of Oswego Westside Wastewater Treatment Plant
4. Breitbeck Park
5. Wrights Landing Marina
6. Oswego Yacht Club
7. International Marina
8. H. Lee White Maritime Museum
9. Essroc Cement Corporation
10. U.S. Coast Guard Station Oswego
11. Oswego Maritime Foundation
12. Sprague Energy Corporation
13. Lafarge Corporation NA – Oswego Cement Terminal
14. NYS Canal Corporation – Oswego Canal Lock 8
15. Oswego Marina
16. Oswego Port Authority
17. Fort Ontario Historic Site
18. City of Oswego Eastside Wastewater Treatment Plant
19. Oswego Lighthouse

Oswego Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	$33M	$333.4M	$366.4M
1,500	$38.5M	$360.9M	$399.4M
2,000	$45.9M	$383.6M	$429.5M



Port Ontario Harbor:

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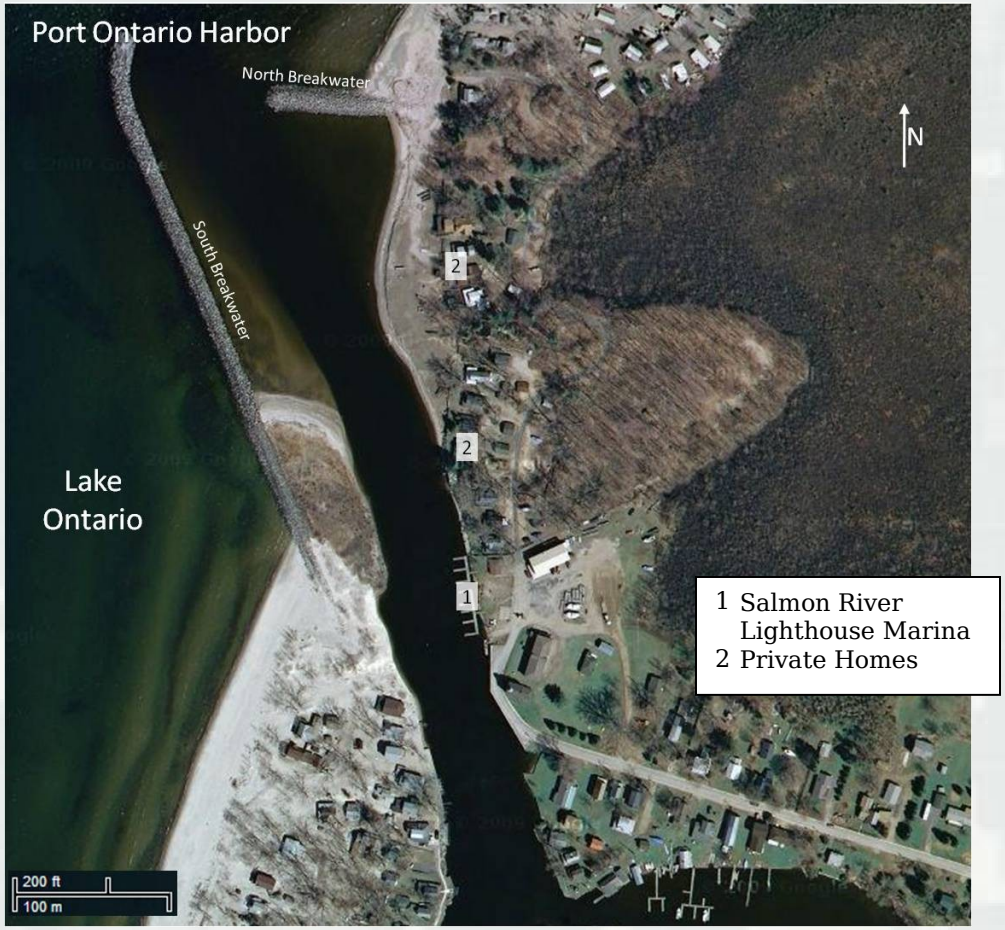
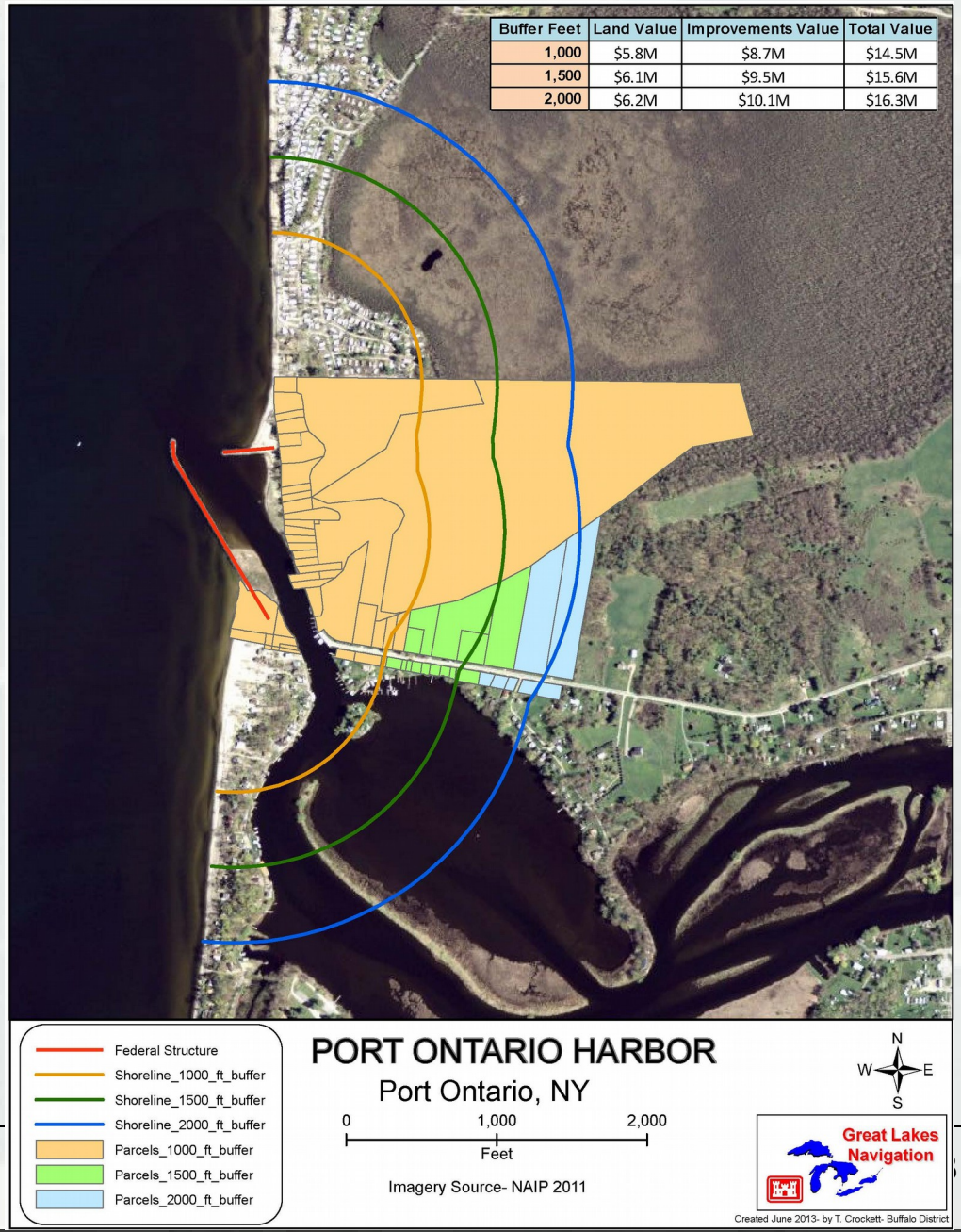
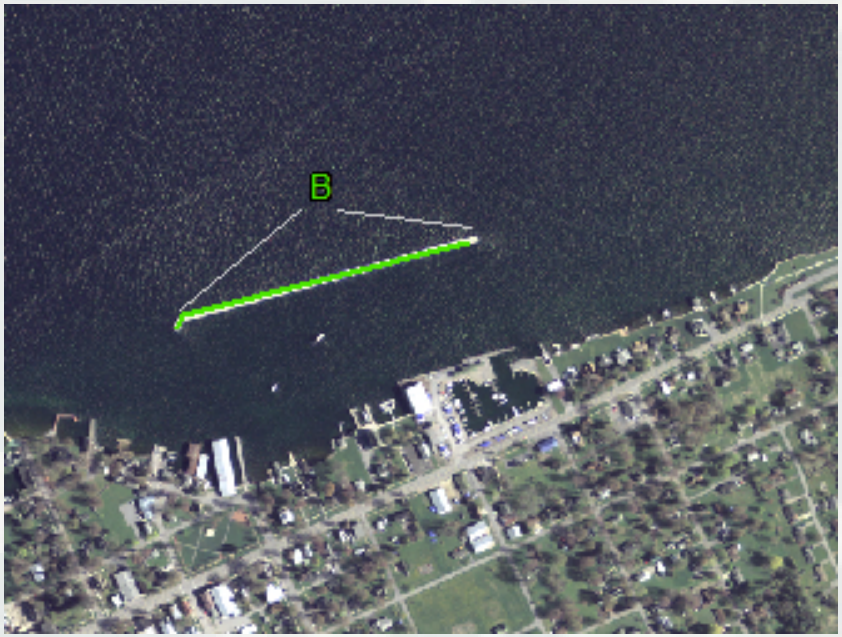


Port Ontario Harbor: Potential Impact Areas



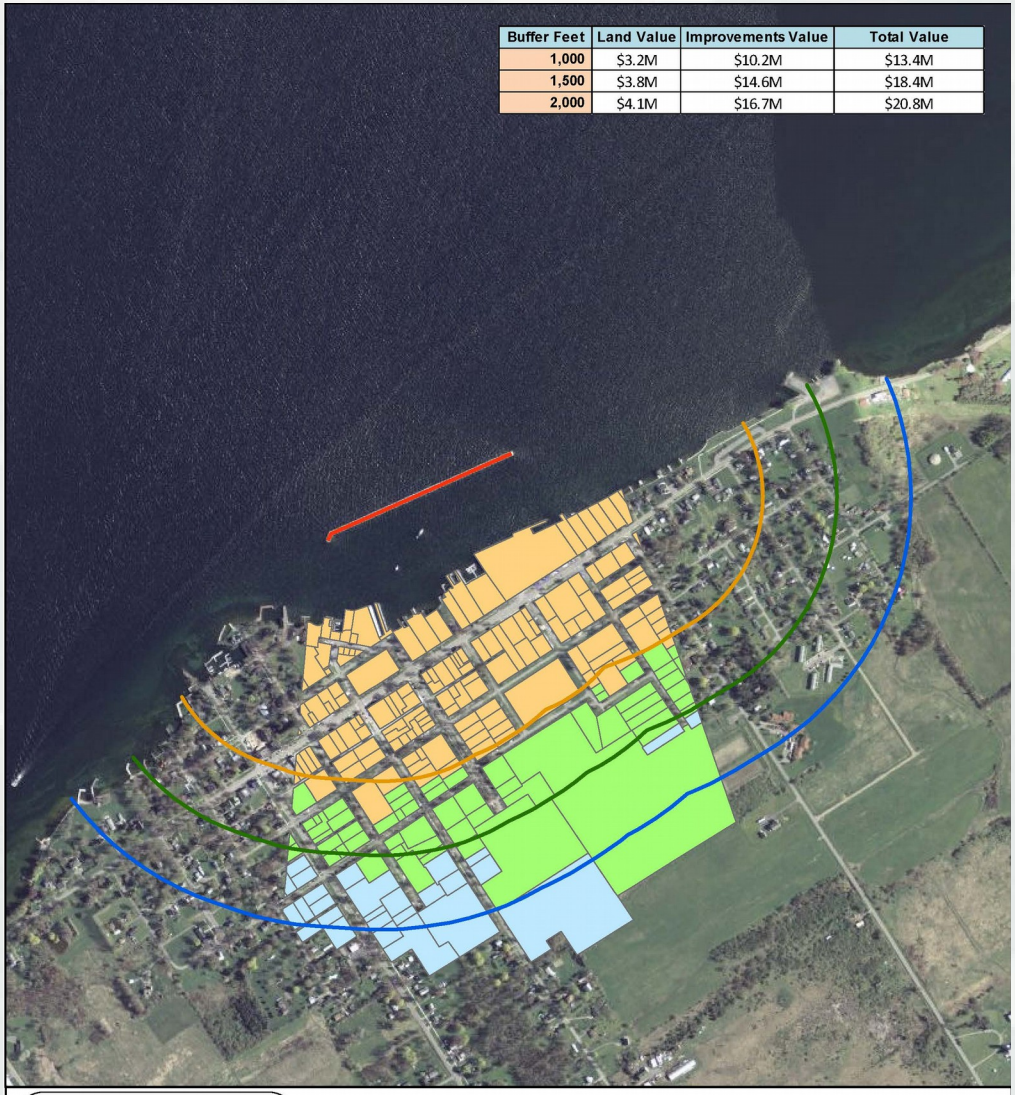
Cape Vincent Harbor:



Cape Vincent Harbor:

Cape Vincent Harbor: Potential Impact Areas

Buffer Feet	Land Value	Improvements Value	Total Value
1,000	$3.2M	$10.2M	$13.4M
1,500	$3.8M	$14.6M	$18.4M
2,000	$4.1M	$16.7M	$20.8M



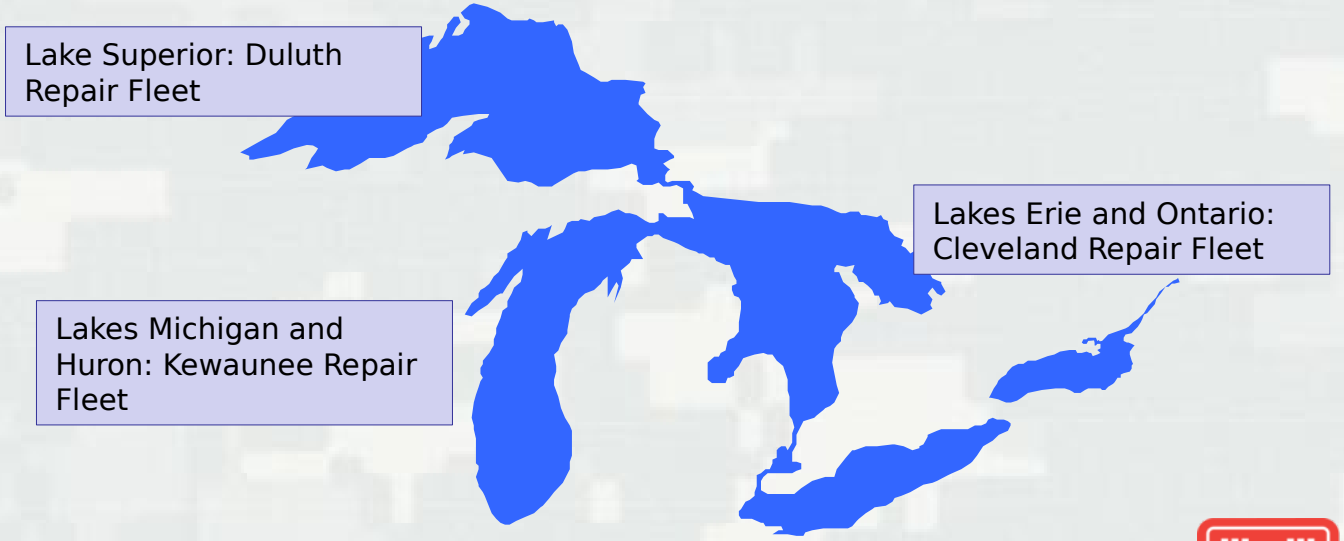
What Can Be Done?

- Federal Funding
  - ► Funding request through the Federal Budget process each fiscal year
    - Contract structural repair
    - Government floating plant repair
- Local Funding
  - ► Mechanisms in place to accept local funding
- Transfer to State/Local Entity
  - ► Section 216 Process

Great Lakes Repair Fleet

- Three repair fleets – one in LRB and two in LRE conduct all of the most urgent repair needs on navigation structures in the five Great Lakes.

- Place stone in weakened sections of structures and CDFs, conduct welding repairs on steel sheeting to retain encapsulation of fill stone; repair safety ladders, signs, and railings; remove obstructions from harbor navigation channels; and are available for a wide variety of “emergency” work including debris removal, lock repair, and other unanticipated repair needs.


Lake Superior: Duluth Repair Fleet
Lakes Erie and Ontario: Cleveland Repair Fleet
Lakes Michigan and Huron: Kewaunee Repair Fleet

Questions?